PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

(Rationalised Report according to the Notice of the President of the EPO published in the OJ11/2001)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
BPX 9882		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB03/02091	15/05/2003	13/06/2002
International Patent Classification (IPC) or national classification and IPC		
E21B37/06		
Applicant		
BP EXPLORATION OPERATING COMPANY LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consists of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22/12/2003	23.08.04
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/GB03/02091

I. Basis of the report

1. This report has been drawn up on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*

☐ the international application as originally filed

☒ the description, pages 1-31 , as originally filed
pages , filed with the demand
pages , filed with the letter of

☒ the claims, Nos. , as originally filed
Nos. , as amended under Article 19
Nos. , filed with the demand
Nos. 1-20 , filed with the letter of 25/03/04

☐ the drawings, sheets / fig. , as originally filed
sheets / fig. , filed with the demand
sheets / fig. , filed with the letter of

2. The amendments have resulted in the cancellation of:

☐ the description, pages:

☐ the claims, Nos.

☐ the drawings, sheets / fig.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2 (c)).

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Claims	2-10, 13-15	YES
	Claims	1, 11, 12, 16-20	NO
Inventive Step	Claims		YES
	Claims	2-10, 13-15	NO
Industrial Applicability	Claims	1-20	YES
	Claims		NO

2. Citations and Explanations

1. Document (1) US-A-4 986 354 discloses a method as in claim 1 in which a solution of an oil field chemical in water is encapsulated with a shell of polymerized coating product which is degradable under the conditions encountered in the formation (see column 3). No difference can be seen either at the level of the particle size, since the microcapsules of doc. (1) are said to be micron sized.

   The arguments of the Applicant regarding alleged differences with respect to the method of claim 1 are not convincing. In particular, nothing in document (1) may suggest that the micro capsules will prematurely release the chemical before reaching the production well. A number of statements in doc. (1) confirm that the chemicals are introduced into any well bores and oil formations. In addition claim 1 does not call for any transfer to the production well, since release of the chemicals may start in the formation. The various considerations regarding the length or duration of the percolation are not relevant, since no data are indicated in claim 1 regarding such parameters.

   Regarding the possible advantages of the microparticles in use in the claimed method, the remarks of the Applicant are not convincing. The suspension is defined in extremely broad terms without any indication of the chemicals used, of the nature of the polymeric phase, of the other constituents and their proportions. As noted above, the suspensions of doc. (1) fall within this broad definition and thus cannot behave differently.

2. The objection of lack of novelty equally applies to claims 11, 12, 16, 17, 18, 19 and 20.

3. The additional features in the remaining subclaims 2 to 10 and 13 to 15 are not regarded as involving an inventive step. In particular the use of diameters slightly lower than 1 micron cannot be regarded as inventive, since micro-sized particles can be used in doc. (1). The selection of the propagation rates is an obvious feature, whereas the distance is by itself not critical. The critical parameters would instead be the selected conditions (such as temperature) and the selected suspensions which may have a bearing on the release. The selection of these parameters is however within the realm of a skilled man. The parameters indicated in claims 5 to 8 could also easily be selected by the skilled man, and document (1) confirms that the degradation is related to the temperature used.

The selection of the parameters indicated in claims 9, 10, 13, 14 and 15 appears conventional in the art. The amounts selected in claims 9 and 10 are usual, as are those used in claim 15, whereas the selection of conventional dispersing agents as in claim 13 appears obvious.

Amended Claims:

1. A method of introducing an oil or gas field production chemical into a subterranean formation comprising:

(a) injecting a suspension comprising microparticles suspended in a liquid medium into a formation through an injection well wherein the microparticles have a mean diameter of less than 1 micron and wherein the microparticles comprise an aqueous phase comprising an aqueous solution of a water-soluble oil or gas field production chemical or an aqueous dispersion of water-dispersible oil or gas field production chemical encapsulated in a continuous polymeric phase, and the polymer forming the continuous polymer phase is degradable under the conditions encountered in the formation;

(b) allowing the suspension to percolate through the formation towards a production well; and

(c) controllably releasing the aqueous solution of the water-soluble oil or gas field production chemical or the aqueous dispersion of the water-dispersible oil or gas field production chemical from the microparticles into the formation and/or the production well through degradation of the polymer forming the continuous polymeric phase.

2. A method as claimed in Claim 1 wherein the microparticles have a mean diameter in the range 100-750 nm.

3. A method as claimed in Claims 1 or 2 wherein the suspension propagates through the formation at a rate of 15 to 100 feet per day.

4. A method as claimed in any one of the preceding claims wherein the injection well is 0.25 to 1 mile from the production well.

5. A method as claimed in any one of the preceding claims wherein the suspension is

injected down the injection well at a temperature of less than 10°C.

6. A method as claimed in any one of the preceding claims wherein the microparticles start to release the aqueous solution or aqueous dispersion of the oil or gas field production chemical at a threshold temperature in the range 50 to 150°C.

7. A method as claimed in any one of the preceding claims wherein the temperature of the injected suspension increases at a rate of 1 to 10°C per 100 feet in the radial direction from the injection well towards the production well.

8. A method as claimed in any one of the preceding claims wherein the microparticles release substantially all of the aqueous solution or aqueous dispersion of the oil or gas field production chemical in the near wellbore region of the production well.

9. A method as claimed in any one of the preceding claims wherein the microparticles are dispersed in the liquid medium in an amount of from 20 to 50% by weight.

10. A method as claimed in any one of the preceding claims wherein the oil or gas field production chemical is dissolved or dispersed in the in the internal aqueous phase of the microparticles in an amount in the range of from 1 to 50 percent by weight, preferably 5 to 30 percent by weight.

11. A method as claimed in any one of the preceding claims wherein the oil or gas field production chemical is selected from the group consisting of water-soluble or water-dispersible (i) scale inhibitors, (ii) corrosion inhibitors, (iii) hydrogen sulphide scavengers and (iv) hydrate inhibitors.

12. A method as claimed in any one of the preceding claims wherein the liquid medium of the suspension is selected from the group consisting of an oil, an organic solvent and water.

13. A method as claimed in claim 12 wherein the liquid medium is a water dispersible organic solvent selected from the group consisting of methyl butyl ether, butyl monoglycol ether and biodegradable esters.

14. A method as claimed in any one of the preceding claims wherein the suspension of microparticles is continuously or intermittently dosed into the injection water.

15. A method as claimed in Claim 14 wherein the production chemical is a scale inhibitor and the amount of scale inhibitor released into water produced from the

production well is in the range 1 to 200 ppm.

16. A method as claimed in any one of the preceding claims wherein the microparticles are microcapsules or microspheres.

17. A method as claimed in Claim 16 wherein the microcapsules comprise a well-defined core of the aqueous solution of the water-soluble oil or gas field production chemical or of the aqueous dispersion of the water-dispersible oil or gas field production chemical, and a well-defined wall comprising the degradable polymer.

18. A method as claimed in Claim 16 wherein the microspheres comprise a continuous polymeric matrix comprising the degradable polymer encapsulating the aqueous solution or aqueous dispersion at either a macroscopic or molecular level.

19. A method as claimed in Claim 18 wherein the polymeric matrix is porous or non-porous.

20. A method as claimed in Claims 18 or 19 wherein a plurality of droplets of the aqueous solution or aqueous dispersion are encapsulated in the polymer matrix.